
Citation:

Beggs, CB and Magnano, C and Belov, P and Krawiecki, J and Ramasamy, DP and Hagemeyer, J and Zivadinov, R (2015) Internal jugular vein cross-sectional area and cerebrospinal fluid pulsatility in the aqueduct of Sylvius. In: 5th Annual meeting of the International Society for Neurovascular Disease, 27 - 28 March 2015, Naples, Italy.

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Internal jugular vein cross-sectional area and cerebrospinal fluid pulsatility in the aqueduct of Sylvius

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Background: Constricted cerebral venous outflow has been linked with increased aqueductal CSF pulsatility in healthy individuals [1] and MS patients [2]. However, the relationship between the CSF pulsatility and internal jugular vein (IJV) cross-sectional area (CSA) is unknown.

Objective: To characterise links between IJV CSA and aqueductal CSF pulsatility in MS patients and healthy subjects.

Methods: 98 relapsing-remitting MS patients (62 males and 36 females; mean age=44.2 years) and 99 healthy controls (48 males and 51 females; mean age=43.9 years) were investigated. CSF flow quantification involved cine phase-contrast MRI, while IJV CSA was calculated using magnetic resonance venography. Cardiovascular risk factor data were collected. Statistical analysis involved correlation, and partial least squares correlation (PLSC), analysis [3].

Results: For healthy controls, PLSC revealed a significant relationship ($p=0.001$) between CSF pulsatility and IJV CSA in the lower neck (C5-C7), and a trend for this relationship ($p=0.091$) at C2-C4. PLSC revealed no relationships in MS patients. After controlling for age and cardiovascular risk factors, many significant correlations were identified in the healthy controls between the CSF and IJV variables [e.g. net positive CSF flow and left IJV CSA at: C7-T1 ($r=0.416$, $p=0.002$) and C5-C6 ($r=0.389$, $p=0.003$); and net negative CSF flow and left IJV CSA at: C7-T1 ($r=-0.352$, $p=0.008$) and C5-C6 ($r=-0.349$, $p=0.009$)], whereas there were only two significant correlations in MS patients [i.e. net positive CSF flow and right IJV CSA at: C5-C6 ($r=0.311$, $p=0.035$) and C4 ($r=0.298$, $p=0.047$)].

Conclusions: In healthy adults, higher aqueductal CSF pulsatility is correlated with increased IJV CSA (particularly in the lower neck) in a relationship independent of age and cardiovascular risk factors. This relationship is largely absent in MS patients. Given CSF pulsatility and venous drainage are linked in healthy individuals [1], it may be that increased IJV CSA is indicative of stasis in venous outflow.

(Word count = 300 words)

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